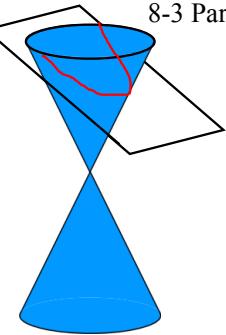


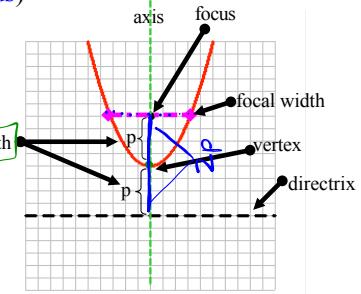
8-3 Parabolas - In Depth

parabola as a conic section



Parabola : set of all points in a plane equidistant from a particular line (**directrix**) and a *equal distant* particular point (**focus**)

the parts of a parabola

axis of symmetry is \perp to the directrix

Focal width - the segment thru the focus perpendicular to the axis of symmetry. Its endpoints lie on the parabola and has length = (parallel to the directrix) $|4p|$

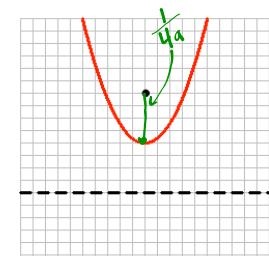
Axis of Symmetry - line \perp to the focal width & directrix. It intersects the parabola at the vertex.

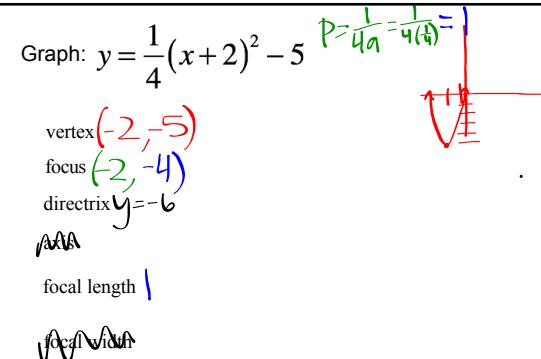
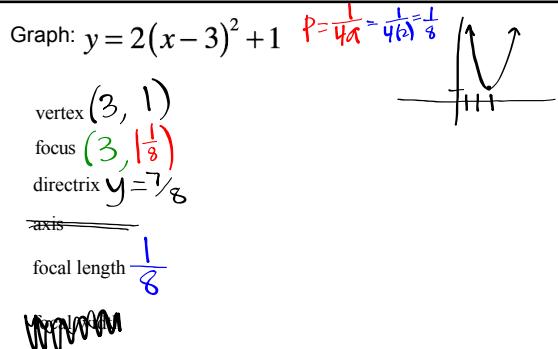
measure from the focus to an endpt of the focal width = measure from the focus to the directrix.

Parabola - standard form

$$y = a(x - h)^2 + k \quad \text{up/down}$$

$$p = \frac{1}{4a} \quad \text{therefore, } a = \frac{1}{4p}$$

vertex (h, k) focus $(h, k + p)$ directrix $y = k - p$ axis $x = h$ focal length p focal width $|4p|$ 



Example:

Write the equation for a parabola with Focus: $(4, 3\frac{1}{4})$ and directrix: $y = 2\frac{3}{4}$

What information do you need to write the equation of a parabola?

$$y = a(x - h)^2 + k \quad a, h, k$$

What do we have? What do we need to find?

$$h \approx 4 \quad a, k$$

To find k : What do we know about the relationship between the point k and distance to the focus and the directrix?

k is in the middle $(4, 3\frac{1}{4})$ $y = 2\frac{3}{4}$ $K = 3$

k is the midpoint between the focus and the directrix

To find a : Remember $p = \frac{1}{4a}$ what did we learn above that allows us to find p ? How can we find a once we know p ?

$$a = \frac{1}{4p} = \frac{1}{4(\frac{1}{4})} = \frac{1}{1} = 1$$

Now we know h, k, and a we can write the equation in vertex form:

$$y = 1(x-4)^2 + 3$$

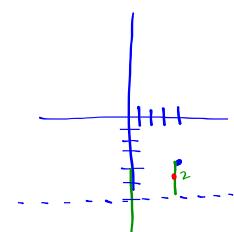
Write the equation for a parabola with F(4, -4) and directrix y = -6

$$P = 1$$

$$a = \frac{1}{4P} = \frac{1}{4(1)} = \frac{1}{4}$$

$$K: -5$$

$$y = \frac{1}{4}(x-4)^2 - 5$$



Write the equation for a parabola with F(-3, -2) and directrix y = 6

$$P = 4$$

$$K = 2$$

$$a = \frac{1}{4P} = \frac{1}{4(4)} = \frac{1}{16}$$

$$y = -\frac{1}{16}(x+3)^2 + 2$$

